Post-Katrina Pollutant and Contaminant Pathways: Downstream Transport or Local Retention?

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As part of a long-term study we have been conducting interdisciplinary shipboard surveys, deploying moored instrumentation and Lagrangian drifters, analyzing remote-sensing data and developing regional models of south Florida's coastal and oceanic waters. The south Florida regional observing system and the Regional South Florida Hybrid Coordinate Model (SoFLA-HYCOM) are being used to evaluate changes in circulation and water properties around Florida Bay, the Florida Keys, and the Dry Tortugas.

South Florida's unique coastal ecosystems have been frequently influenced by remote events outside of our study area. In particular, we have episodically observed the incursion of waters originating well to the north in the Gulf of Mexico including Mississippi River water. The Loop Current/Florida Current system, with its complex eddy field, provides a delivery mechanism for this input.

It was apparent that our regional efforts alone would not suffice to determine the probability of pollutant exposures resulting from the landfall of Hurricanes Katrina and Rita. As a contribution to the overall federal response, AOML and its academic and industry collaborators, along with the State of Florida, initiated a coordinated set of oceanographic cruises, coastal and ocean drifter deployments, analyses of satellite data and numerical simulation results (HYCOM Consortium for Data Assimilation) to address this specific issue. Data and analyses were made available to the public in near real-time via the Internet: http://www.aoml.noaa.gov/ocd/hurricaneresponse

The mechanisms of offshore or alongshore transport, of removal or retention, are highly variable since they are influenced by the development and evolution of the buoyant Mississippi River plume, local wind stress, and the interaction between coastal and large scale flows. In addition, the exact position of the Loop Current front and associated spin-off or frontal eddies is a major factor facilitating or preventing downstream transport to south Florida. Shipboard survey data, station data, satellite observations, and numerical simulations are used to address the contributions of these various processes.

Our synthesis of the data and model results suggests that while some water originating just west of the Mississippi delta was carried offshore eventually reaching south Florida waters, coastal retention and westward alongshore transport processes were dominant in the weeks following hurricanes Katrina and Rita. Moreover, these powerful hurricanes greatly influenced the eddy field in the Gulf of Mexico, affecting subsequent pathways of Mississippi waters around the delta and beyond.